Aravind Rajeswaran

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Research Interests

Mathematical foundation and applications of machine learning and optimization. In particular:

- Algorithms and theory for interactive learning (RL, bandits, active etc)
- Deep Reinforcement Learning and computer vision for robotics
- Multi-view and multi-modal common representation learning for knowledge transfer

Education

Indian Institute of Technology, Madras *Aug 2011 – July 2015*

BTech (Hons) with focus on optimization, machine learning, and control

- **Thesis :** Topological search over networks *(best undergraduate thesis award)*
- **Key Courses :** Machine Learning, Reinforcement Learning, Numerical Optimization, Multivariate Data Analysis, Time Series Analysis, Optimal Control, Design of Algorithms, Complex Networks
- **Advisers :** Profs. Balaraman Ravindran, Shankar Narasimhan, Sridharakumar Narasimhan

Academic awards and Honors

- PhD fellowships from University of Washington, UC Berkeley, and Caltech among others. *2016*
- Bhagyalakshmi and Krishna Ayengar award for best undergraduate thesis. *2015*
- Summer student fellowship award from the CS and Statistical Physics groups of IMSc, India. *2014*
- Colonel Krishnaswamy award for academic excellence (*roughly* equivalent to Valedictorian) *2011*

Research Experience

- **Computer Science Dept, IIT Madras** - Research Assistant
  Mentor: Balaraman Ravindran *Oct 2015 - June 2016*
  Studied the problem of Safe Reinforcement Learning (S-RL) which aims to find the optimal (or near-optimal) policy while providing guarantees for safety/performance throughout the learning phase. We developed a practical algorithm which enhances safety by pre-training over a distribution of potential MDPs in simulation. I also developed a theoretical paradigm for interactive learning in KWIK framework which has close connections to S-RL.
- **Interdisciplinary Laboratory for Data Sciences, IIT Madras**
  Mentor(s) : Shankar Narasimhan and Sridharakumar Narasimhan *Jan 2014 - July 2015*
  Worked on theory and applications of optimization for **infrastructure system developments.** Used network structure analysis, integer programming, data mining, and stochastic control: to model and operate complex networks like smart grids, water, and transpiration systems.
- **The Institute of Mathematical Scienes** - Summer Intern
  Mentor : Sitabhra Sinha *May 2014 - Jan 2015*
  Using Monte Carlo simulations, we proved that the random walk betweenness centrality (RWBC) is a statistically robust indicator of a unit's role in propagating a cascade, in complex networks with conserved flows (eg power grids).

Publications and Presentations

1. S. Jayadev, A. Rajeswaran, N. Bhatt, and R. Pasumarthy, *A Novel Approach for Phase Identification in Smart Grids Using Graph Theory and Principal Component Analysis.* American Control Conference 2016.
2. Aravind Rajeswaran, Sridharakumar Narasimhan, and Shankar Narasimhan, *A graph partitioning approach for leak detection in water distribution networks. (under review)* arXiv preprint arxiv:1606.01754
3. Aravind Rajeswaran and Shankar Narasimhan. *Network Topology Identification using PCA and its Graph Theoretic Interpretations.* arXiv preprint arxiv:1506.00438 (2015).

Computer Skills

- **Programming Languages:** C++, Python. Experience with MPI and OpenMP.
- **Software & Applications:** MATLAB, R, Mathematica, LaTeX
- **Libraries:** NumPy, Caffe, Theano, scikit-learn, GraphLab, NetworkX
- **Modelling Tools:** CVX, YALMIP, TOMLAB, GAMS

References

- **Dr. Balaraman Ravindran**, Associate Professor, IIT Madras.
- **Dr. Shankar Narasimhan**, Professor, IIT Madras.
- **Dr. Sridharakumar Narasimhan**, Associate Professor, IIT Madras.
- **Dr. Sitabhra Sinha**, Professor, IMSc.